Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Spectrum Needs for the Implementation of the Positive Train Control Provisions of the Rail Safety Improvement Act of 2008	)))	WT Docket No. 11-79
	)	

REPLY COMMENTS OF PTC-220, LLC

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I. INTRODUCTION AND SUMMARY

PTC-220, LLC ("PTC-220") hereby submits these reply comments in response to initial comments filed in the above-referenced proceeding.[1] The initial comments overwhelmingly supported the greater availability of spectrum in the 217 – 222 MHz range for the deployment of positive train control ("PTC"). As detailed below, PTC-220:

- Supports the widespread calls for the reallocation of the former Interactive Video and Data Service ("IVDS") band for PTC;
- Refutes the unfounded assertions from SkyTel and its consultant Ronald Lindsey by demonstrating that: (1) the integration of intermediate signals into PTC does not exceed regulatory requirements; (2) many other options, including the 160 MHz band, were exhaustively considered before pursuing 220 MHz for PTC; and (3) 220 MHz spectrum was not acquired for profit or for warehousing;
- Concurs with the California High Speed Rail Authority that 220 MHz PTC technology may not be able to meet the unique PTC requirements for high speed rail; and

[1] *See Wireless Telecommunications Bureau Seeks Comment on Spectrum Needs for the Implementation of the Positive Train Control Provisions of the Rail Safety Improvement Act of 2008*, Public Notice, DA 11-838 (rel. May 5, 2011) ("*Public Notice*").

- Updates the Commission on the status of two congested area channel loading studies currently underway.

II. PTC-220 SUPPORTS COMMENTERS' CALLS FOR A REALLOCATION OF THE 218-219 MHZ BAND FOR PTC

PTC-220 agrees with the many commenters suggesting that the Commission should reallocate some or all of the spectrum in the 218-219 MHz Radio Service band (formerly known as IVDS) for PTC.[2] In its comments, Amtrak makes a compelling case that the underutilized former IVDS band is ripe for reallocation for a more productive use, such as PTC. Amtrak notes that a review of the Commission's Universal Licensing System reveals that:

> there are only 48 active licenses in the entire 218-219 MHz radio service: 18 active A-block licenses, and 30 active B-block licenses. More significantly, in all but seven out of the 734 market areas used for licensing in the service, at least 500 kHz is available for assignment for PTC; indeed, in all but 34 markets, the full 1 MHz of spectrum in the 218-219 Radio Service remains unassigned.[3]

Indeed, the logic of reallocating the former IVDS band for PTC was laid out over a year ago by MTA in its comments responding to the Commission's Auction No. 89 public notice, and in two other filings.[4] Moreover, reallocation of this spectrum would also be consistent with the recommendation of the Federal Railroad Administration ("FRA") which, in its letter prepared in

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[2] *See* Comments of Amtrak ("Amtrak Comments") at 7; Comments of the American Public Transport Association ("APTA Comments") at 1-2; Comments of the Dallas Area Rapid Transit Authority ("DART Comments") at 8; Comments of the Joint Council on Transit Wireless Communications ("Joint Council Comments") at 4; Comments of the Metropolitan Transportation Authority ("MTA Comments") at 6; Comments of the Peninsula Corridor Joint Powers Board ("Peninsula Corridor Comments") at 4-5. *See also* Comments of the Southern California Regional Rail Authority ("SCRRA Comments") at 2 (supporting the Peninsula Corridor Comments).

[3] Amtrak Comments at 7. If only 500 kHz is reallocated for PTC, the few affected active licensees in the band could be relocated to the other half of the band or, if the full 1 MHz is reallocated, they could be relocated to other nearby channels in the 220 MHz Radio Service that are not licensed. *Id.*

[4] *See* MTA Comments at 5.

response to the *Public Notice*, stated that it "strongly encourages the Commission to consider designation and allocation of spectrum in the 216 MHz to 222 MHz range" for PTC.[5]

PTC-220 also supports Amtrak's suggestion that any forfeited, revoked or automatically terminated licenses in the AMTS, former IVDS or 220 MHz radio services should be made available for PTC use instead of relicensed pursuant to existing rules,[6] and further suggests that other suitable (*i.e.*, contiguous) Phase II 220 MHz licenses could be repurposed for PTC. As PTC-220 noted in its comments, any spectrum within the 217.6 – 222 MHz range would be appropriate for the PTC systems being deployed by PTC-220 members.[7]

If the Commission makes the former IVDS or other spectrum available for PTC, all railroads should be eligible for the spectrum. The Commission should not, as some commenters have suggested, impose discriminatory eligibility restrictions that would bar freight railroads, or any railroad that is not publicly funded, from accessing the spectrum.[8] PTC serves a general public safety and safety of life purpose regardless of the type of railroad operating the PTC infrastructure, and is mandated for all passenger and major freight railroads by the Rail Safety Improvement Act of 2008 ("RSIA").[9] Moreover, restricting any new spectrum only to publicly-funded passenger railroads would create an inefficient use of the spectrum, given that there will be many geographic areas where there are *no* publicly-funded passenger railroads, or where such railroads would not require the entire allocation of the spectrum to cover their PTC needs. It would be senseless to require the spectrum to lie fallow in such areas.

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[5] Letter from Joseph C. Szabo, Administrator, Federal Railroad Administration, to Edward Davison, Chairman, Interdepartment Radio Advisory Committee (June 13, 2011) at 3 ("FRA Letter").

[6] Amtrak Comments at 8.

[7] *See* Comments of PTC-220, LLC at 2.

[8] *See* APTA Comments at 1-2; Joint Council Comments at 4; Peninsula Corridor Comments at 4-5.

[9] *See* Rail Safety Improvement Act of 2008, Pub. L. No. 110-432, 122 Stat. 4848 (2008).

In addition, access to the spectrum should be available to all railroads on an equal cost basis. This concept should flow through to any secondary markets transactions. Thus, if a licensee receives spectrum from the Commission without cost, any lease of that spectrum to another railroad for PTC use should likewise be on a no-cost basis.[10] Licensees of unauctioned spectrum should not be given an incentive to acquire more spectrum than necessary in order to make a profit. However, the Commission's service rules should allow and promote the leasing of spectrum to other railroads. Where multiple railroads are deploying the same PTC protocol, both spectrum and infrastructure efficiencies can be achieved by pooling spectrum for shared use. In its letter, FRA indicated that it "is a strong advocate of shared use of communications spectrum by freight and passenger railroads wherever feasible. This not only facilitates interoperability, but reduces costs by eliminating the need for multiple redundant PTC and communications systems."[11] Moreover, by encouraging interoperability and spectrum sharing arrangements, the Commission would also promote more efficient use of the spectrum it makes available for PTC operations, thereby reducing the overall amount of spectrum needed for such operations. Thus, the Commission should attach a requirement to any unauctioned PTC spectrum that the licensee be required, upon request, to enter into good faith negotiations with other railroads to determine if a spectrum sharing arrangement would be technically feasible.

Finally, although PTC-220 strongly supports the reallocation of additional spectrum for PTC, it cautions that a full notice and comment rulemaking proceeding needed to implement the reallocation and associated service rules may take too long to solve the spectrum problem for railroads racing to meet the statutory December 31, 2015 deadline for PTC deployment. Railroads will need to have assurance of their spectrum assignments well in advance of the

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[10] However, PTC-220 recognizes that leasing transactions often involve modest administrative and legal costs that are appropriate for recovery by the licensee.

[11] FRA Letter at 3.

deadline in order to have time to plan, construct and test their PTC systems. Thus, it may be necessary for the Commission to make the spectrum available initially via waiver until the rulemaking proceeding can be completed.

III. THE ASSERTIONS BY SKYTEL AND MR. LINDSEY DO NOT REFLECT REALITY

While the vast majority of commenters supported making additional spectrum in the 220 MHz range available for PTC use, one commenter and its hired consultant made several unsupported assertions to argue that 220 MHz spectrum is not needed for PTC. Below, PTC-220 explains why the comments filed by Ronald Lindsey of Communication Architecture, and those of its sponsor, Skybridge Spectrum Foundation *et al*. ("SkyTel") are ill-informed and should not concern the Commission.[12]

The integration of intermediate signals into PTC does not exceed regulatory requirements. In his comments, Mr. Lindsey suggests that the Class I railroads are designing a more complex wireless data network – presumably requiring more 220 MHz spectrum – than is required by the federal PTC mandate by incorporating intermediate signals.[13] This is not correct. The FRA's regulations impose PTC operational requirements under conditions present specifically at intermediate signal locations, and wireless monitoring of intermediate signals is one of only two possible methods to achieve compliance.[14] The FRA is so sensitive to the methods by which railroads will achieve compliance with these regulations that specific

[12] *See* Comments of Skybridge Spectrum Foundation *et al*. ("SkyTel Comments") and Comments of Ronald A. Lindsey, Communication Architecture ("Lindsey Comments").

[13] *See* Lindsey Comments at 3. An intermediate signal is "[a] roadway signal operated either automatically or manually at the entrance to a block." *See* 49 C.F.R. § 236.804.

[14] *See* 49 C.F.R. § 236.1005(f)(1)(i)-(ii). The second option, integration with cab signals, as a practical matter may only be utilized on those few lines already equipped with cab signals. A cab signal is "[a] signal located in engineman's compartment or cab, indicating a condition affecting the movement of a train and used in conjunction with interlocking signals and in conjunction with or in lieu of block signals." 49 C.F.R. § 236.805. Cab signals are actuated by electronic signals transmitted through the rails from wayside signal equipment to the locomotive.

requirements to provide descriptions of these methods appear in each of the regulations governing the content of the railroads' PTC Development Plan and PTC Safety Plans.[15] Lastly, during review of the railroads' joint PTC Development Plan, the FRA provided no comment taking exception to the monitoring of intermediate signals as the means by which compliance with the requirements of the PTC statute and regulations is to be achieved.

Monitoring of intermediate signals also provides a method to meet the requirement to prevent unsafe train movement through switches in improper position. The FRA, recognizing that switches are already interlocked with a signal system in existing installations, specifically recognizes this method in its regulations.[16] Monitoring of intermediate signals eliminates the need to directly monitor each and every switch in signaled territory. Thus, it actually *reduces* wireless network complexity compared to other options, as it avoids the need to install transmitters at a correspondingly larger number of switch locations. By reducing the aggregate number of transmitters, the wireless spectrum demand required to support PTC operations is also reduced.

Other options were exhaustively considered before pursuing 220 MHz for PTC. Mr. Lindsey criticizes the railroads for pursuing the 220 MHz band without first considering what could be achieved with other options, such as a digital trunked 160-161 MHz radio system, the use of MeteorComm's 44 MHz network technology, cellular systems, or software defined radio.[17] Again, these assertions are unfounded.

<u>The 160 MHz Band</u>. In 2005, the Association of American Railroads ("AAR") commissioned a survey of RF bands that could be suitable for PTC, and asked for a

[15] *See* 49 C.F.R. §§ 236.1013(a)(9); 236.1015(d)(15).

[16] *See* 49 C.F.R. § 236.1005(e)(1).

[17] Lindsey Comments at 6.

recommendation of the best band for this purpose. The results of the study, issued in January 2006, concluded that, although not without significant challenges, the railroad's 160 MHz band was the best candidate to support PTC operations.[18] The industry accepted this conclusion, and subsequently focused on finding solutions to the challenges of placing PTC in this band. These challenges included:

- only a very limited number of PTC channels could be provided;
- clearing these channels of incumbent railroad users, especially in congested areas, could be severely disruptive; and
- a serious potential for debilitating interaction with collocated 160 MHz voice radios, especially on mobile units aboard locomotives.

To address the last of these issues, the industry commissioned, under an FRA grant, the design of a new radio that would integrate data and voice. The industry also developed a new channel plan for the band that included a number of "wide" channels in the center of the band to accommodate PTC.[19] This work was well underway when some nationwide 220 MHz licenses became available in 2007. This was considered a game-changing event, and the industry immediately began an intense evaluation of the new spectrum in light of the now well-understood difficulties with the 160 MHz band. The ultimate decision was to buy the 220 MHz licenses and to shift efforts from 160 MHz to 220 MHz.

Trunking. Contrary to Mr. Lindsey's claims, the freight rail industry has been investigating the potential use of trunking technology in the 160 MHz band for many years, including a Union Pacific/BNSF P25 trunking pilot in the Portland, Oregon area begun in 2001, which continues today. There are a number of unique challenges presented by some rail radio applications that raise concerns with regard to trunking. For example, rail switching operations can require very tightly timed radio interchanges not compatible with the potential wait times

[18] In this study the more generic term Technology Driven Operations ("TDO") was used instead of PTC.

[19] *See* Exhibit A (AAR VHF Channel Plan). Development of the new channel plan was also motivated by the Commission's narrowbanding mandate.

involved in trunk channel access. Also, the statistical possibility of having a trunk channel request denied or delayed is not conducive to safe and efficient switching operations. Delays and/or uncertainty related to trunk channel access pose significant operational safety concerns during rail switching operations.

Despite these concerns, all major railroads have been monitoring a Canadian Pacific Railway trial of trunking operations, including switching, in the Vancouver area. Most of the major North American railroads believe that trunking will play a part in the future of the 160 MHz band. This is evidenced by the adoption of the new channel plan for the industry that provides for channel trunk groups.[20] However, the move to trunking in the 160 MHz band will be a slow one. Trunked radio systems are more complex to design, deploy, configure, and troubleshoot, and require skill sets not widely available in the industry today.[21] Thus, even if the 160 MHz band did not have other issues making it a challenging choice for PTC, it is clear that 160 MHz trunking technology would not be adequately developed and tested in time to satisfy the PTC implementation deadline.

Cellular Systems. Alternate wireless networks, including cellular, are integral components of the overall PTC architecture. However, cellular is not considered a good candidate for the primary overall interoperable communications path for PTC for several reasons:

- *Coverage*. Though cellular coverage is continuously improving, there are places where railroads operate that will never be attractive for commercial cellular services. Advertized coverage claims very often refer to population and not geography.
- *Availability*. Cellular networks are inherently shared networks of finite capacity. Unusual events can place unpredictable burdens on cellular systems, which could limit availability when it is needed the most. Further, there are no service reliability guarantees for cellular

[20] *See* Exhibit A (highlighting channel trunk groups).

[21] Further, there are only a limited number of areas where the need for the spectrum efficiency of trunking is critical, and in many cases, going to 12.5 kHz or especially 6.25 kHz channel bandwidths will be sufficient to resolve most problems.

service and restoration of interrupted service is out of the hands of cellular customers, who may have little say in the priority of restorations.

- *Obsolescence/Stranded Investment Risk.* Cellular customers have little input into whether or when a technology is determined to be obsolete, and must be replaced. For example, customers using the AMPS system were forced to upgrade, although it was perfectly adequate for many users.

Individual railroads may choose to implement cellular or other alternate communications into their PTC networks to varying degrees as they see fit, but 220 MHz has been defined as the common interoperable communications path.

<u>MeteorComm 44 MHz Technology</u>. Mr. Lindsey incorrectly suggests that the industry could use 44 MHz for PTC, which is available nationwide.[22] BNSF Railway Company's original purchase of MeteorComm's 44 MHz technology was focused on a low throughput data radio system to provide hyrail position reporting for a Hyrail Limits Compliance System ("HLCS").[23] Early in the HLCS deployment, BNSF was hopeful that the 44 MHz system would provide suitable coverage with fewer base stations than the 160 MHz train dispatcher voice network. Although the 44 MHz system did have greater propagation than the 160 MHz network, it became apparent that due to atmospheric effects in this band, the same number of 44 MHz base stations were needed as in the 160 MHz network. BNSF also used the 44 MHz technology in pilot Electronic Train Management System ("ETMS") territories and discovered that the technology also had inherent man-made noise issues, especially in the locomotive environment. The technology also experienced atmospheric skip problems that made channel management and distant base station interference prevalent. Although the 44 MHz system did have some positive attributes, the 220 MHz spectrum has better features that make it more attractive for PTC. Indeed, in a study commissioned by Union Pacific, Richard W. Moss of the Georgia Tech Research

[22] *See* Lindsey Comments at 5 (asserting that BNSF purchased MeteorComm's network for PTC use).

[23] Hyrail systems enable rubber tire vehicles to operate on railroad tracks.

Institute compared 44 MHz to 220 MHz and found 220 MHz spectrum to have less skip and distant signal interference, lower susceptibility to man-made noise issues, better receiver sensitivity and superior link reliability.[24]

Software Defined Radio. The MeteorComm radio being developed for PTC *is* a software defined radio. Though it is only required to operate in a single band with two defined modulations under PTC requirements, it could see more varied use in the future.

220 MHz spectrum was not acquired for profit or for warehousing. Despite the allegations of SkyTel,[25] the freight railroad industry purchased 220 MHz spectrum to develop a non-commercial PTC system for monitoring train activity, preventing train collisions, and enhancing public safety, not for a profit incentive. Spectrum acquisition is one of several significant expenses being incurred to meet the rigorous roll-out requirements for PTC. There is no profit incentive driving the choice of 220 MHz spectrum for PTC. PTC-220 was organized to operate without making any profit for its member railroads. Moreover, SkyTel's implication that the railroad industry has a history of warehousing spectrum, based on its experience with the 900 MHz band, is unfounded.[26] Attached as Exhibit B is a map illustrating the deployment by railroads of 900 MHz spectrum, largely in support of signal system infrastructure, at over 1700 locations nationwide.

IV. 220 MHZ PTC MAY NOT BE ABLE TO SUPPORT THE SPECIAL NEEDS OF HIGH SPEED RAIL

The California High-Speed Rail Authority ("CHSRA") commented that, due to its high-speed operations and different regulatory requirements, it has different PTC requirements than

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[24] R. W. Moss, Georgia Tech Research Institute, *Comments on Low Band VHF versus High Band VHF (44 MHz vs. 220 MHz)* (2007).

[25] *See* SkyTel Comments at 2.

[26] *See id.* at 3.

conventional railroads.[27] CHSRA also noted that it is uncertain whether PTC systems currently under development for the 220 MHz band could be adapted for use at speeds of 250 mph.[28] PTC-220 agrees. The maximum speed requirement for PTC for freight railroads, with input from Amtrak, is significantly below 250 mph. Until the 220 MHz PTC system can be tested with finalized radio equipment, PTC-220 cannot be certain what degradations in performance will be exposed at speeds approaching 250 mph.

Notwithstanding the above, it appears highly unlikely that there would be any sharing of track between CHSRA and any freight or other conventional (non-high speed) railroad, which implies that there would be no interoperability requirement. This would allow CHSRA to operate an entirely different PTC system from surrounding conventional railroads. From this standpoint, PTC-220 would not in theory object to a spectrum allocation to support GSM-R along CHSRA's right-of-way. CHSRA suggests that the ideal band of operation for GSM-R would be 876-880/921-925 MHz.[29] But PTC-220 recommends caution here, given that all major freight railroads, which could be in close proximity to CHSRA's track, operate Automatic Equipment Identification ("AEI") systems that may use channels within this range. More importantly, PTC-220 rejects any suggestion that the major freight railroads be forced to abandon their current approach in favor of using GSM-R. The industry is too far along its current path, and too close to impending deadlines to entertain any idea of a major change of direction.

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[27] *See* Comments of the California High-Speed Rail Authority ("CHSRA Comments") at § 2.4. *See also* FRA Letter at 3 (noting the different PTC needs of high speed rail).

[28] *See* CHSRA Comments at § 2.2.3. Given CHSRA's legitimate concerns about operating at 220 MHz, its unsupported allegations regarding the expected future business practices of MeteorComm LLC, *see id.*, would seem to be moot. Tellingly, no other commenter raised these baseless allegations.

[29] *See id.* at §2.4.

V. ONGOING SPECTRUM DEMAND STUDIES

The Class I freight railroads believe they have purchased enough spectrum in non-congested areas to support PTC functionality. The freight and passenger railroads, however, do not yet have a definitive measure of the amount of spectrum needed to support PTC functionality in complex, congested areas. Although PTC-220 has built predictive models to simulate PTC channel loading, they were designed for specific environments and traffic scenarios. For example, the models suggest that the railroads are unlikely to need the entire IVDS or AMTS bands for PTC operations in a particular area, but they do not indicate the quantity or location of spectrum needed to ensure reliable PTC performance. Thus, while these simulations are helpful and instructive, uncertainty remains. Factors contributing to this uncertainty include:

- In complex terminal areas, there may be many independent rail operators, each offering its own message load to the system. Aggregate message load profiles are an area of ongoing study.

- The PTC application is still under development, and message sizes, frequencies, and trigger conditions have not completely stabilized.

- The PTC-220 radio and associated over-the-air protocols are still under development, so overall capacity and how capacity reacts to various loading conditions are not fully determined.

- Because the PTC system is designed as a network, the amount of spectrum needed will be affected by the extent to which systems are interoperable and entities have incentives to enter spectrum sharing arrangements.

Given these challenges, there are two comprehensive area RF channel loading studies underway:

- *Los Angeles Basin*. The Transportation Technology Center, Inc. ("TTCI"), a subsidiary of the AAR under contract to PTC-220, and Parsons Corporation, contractor to Southern California Regional Rail Authority ("SCRRA"), are in the process of producing a comprehensive channel loading study for the Los Angeles area.

- *Chicago*. TTCI has been contracted by PTC-220 to develop an RF channel loading study for PTC in the Chicago area. Work is just starting on this effort. Chicago is thought to represent one of the most challenging PTC areas in the country. All seven Class I railroads operate there, along with a number of smaller freight and passenger railroads.

These congested area channel loading studies are based on historical and projected future rail traffic levels and patterns, and should provide a good picture of spectrum needs in these high-traffic areas. PTC-220 expects both studies to be finished by late 2011. Railroad field testing will be conducted in early 2012 and will assist in the validation of these RF channel loading studies**.**

VI. CONCLUSION

PTC-220 urges the Commission to act expeditiously in making spectrum in the 217.6 – 222 MHz range available for PTC, whether through waivers and/or the reallocation of existing radio services. As explained above and by many commenters, the former IVDS band is particularly well-suited for reallocation. To be useful, however, any Commission action must be cognizant of the railroads' need to have certitude with regard to the spectrum they will be using for PTC well in advance of the statutory 2015 deadline for PTC implementation.

Respectfully Submitted,

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EXHIBIT A

AAR VHF Channel Plan

Version 3.2

Base

25 kHz	12.5 kHz	6.25 kHz	
	104	302	160.1775
05	005	303	160.1850
	105	304	160.1925
06	006	305	160.2000
	106	306	160.2075
07	007	307	160.2150
	107	308	160.2225
08	008	309	160.2300
	108	310	160.2375
09	009	311	160.2450
	109	312	160.2525
10	010	313	160.2600
	110	314	160.2675
11	011	315	160.2750
	111	316	160.2825
12	012	317	160.2900
	112	318	160.2975
13	013	319	160.3050
	113	320	160.3125
14	014	321	160.3200
	114	322	160.3275
15	015	323	160.3350
	115	324	160.3425
16	016	325	160.3500
	116	326	160.3575
17	017	327	160.3650
	117	328	160.3725
18	018	329	160.3800
	118	330	160.3875
19	019	331	160.3950
	119	332	160.4025
20	020	333	160.4100
	120	334	160.4175
21	021	335	160.4250
	121	336	160.4325
22	022	337	160.4400
	122	338	160.4475
23	023	339	160.4550
	123	340	160.4625
24	024	341	160.4700
	124	342	160.4775

25 kHz	12.5 kHz	6.25 kHz	
25	025	343	160.4850
	125	344	160.4925
26	026	345	160.5000
	126	346	160.5075
27	027	347	160.5150
	127	348	160.5225
28	028	349	160.5300
	128	350	160.5375
29	029	351	160.5450
	129	352	160.5525
30	030	353	160.5600
	130	354	160.5675
31	031	355	160.5750
	131	356	160.5825
32	032	357	160.5900
	132	358	160.5975
33	033	359	160.6050
	133	360	160.6125
34	034	361	160.6200
	134	362	160.6275
35	035	363	160.6350
	135	364	160.6425
36	036	365	160.6500
	136	366	160.6575
37	037	367	160.6650
	137	368	160.6725
38	038	369	160.6800
	138	370	160.6875
39	039	371	160.6950
	139	372	160.7025
40	040	373	160.7100
	140	374	160.7175
41	041	375	160.7250
	141	376	160.7325

Trunk Groups

HPDR

25 kHz	12.5 kHz	6.25 kHz	
42	042	377	160.7400
	142	378	160.7475
43	043	379	160.7550
	143	380	160.7625
44	044	381	160.7700
	144	382	160.7775
45	045	383	160.7850
	145	384	160.7925
46	046	385	160.8000
	146	386	160.8075
47	047	387	160.8150
	147	388	160.8225
48	048	389	160.8300
	148	390	160.8375
49	049	391	160.8450
	149	392	160.8525
50	050	393	160.8600
	150	394	160.8675
51	051	395	160.8750
	151	396	160.8825
52	052	397	160.8900
	152	398	160.8975
53	053	399	160.9050
	153	400	160.9125
54	054	401	160.9200
	154	402	160.9275
55	055	403	160.9350
	155	404	160.9425
56	056	405	160.9500
	156	406	160.9575
57	057	407	160.9650
	157	408	160.9725
58	058	409	160.9800
	158	410	160.9875
59	059	411	160.9950
	159	412	161.0025
60	060	413	161.0100
	160	414	161.0175
61	061	415	161.0250
	161	416	161.0325
62	062	417	161.0400
	162	418	161.0475

Mobile

25 kHz	12.5 kHz	6.25 kHz	
63	063	419	161.0550
	163	420	161.0625
64	064	421	161.0700
	164	422	161.0775
65	065	423	161.0850
	165	424	161.0925
66	066	425	161.1000
	166	426	161.1075
67	067	427	161.1150
	167	428	161.1225
68	068	429	161.1300
	168	430	161.1375
69	069	431	161.1450
	169	432	161.1525
70	070	433	161.1600
	170	434	161.1675
71	071	435	161.1750
	171	436	161.1825
72	072	437	161.1900
	172	438	161.1975
73	073	439	161.2050
	173	440	161.2125
74	074	441	161.2200
	174	442	161.2275
75	075	443	161.2350
	175	444	161.2425
76	076	445	161.2500
	176	446	161.2575
77	077	447	161.2650
	177	448	161.2725
78	078	449	161.2800
	178	450	161.2875
79	079	451	161.2950
	179	452	161.3025
80	080	453	161.3100
	180	454	161.3175

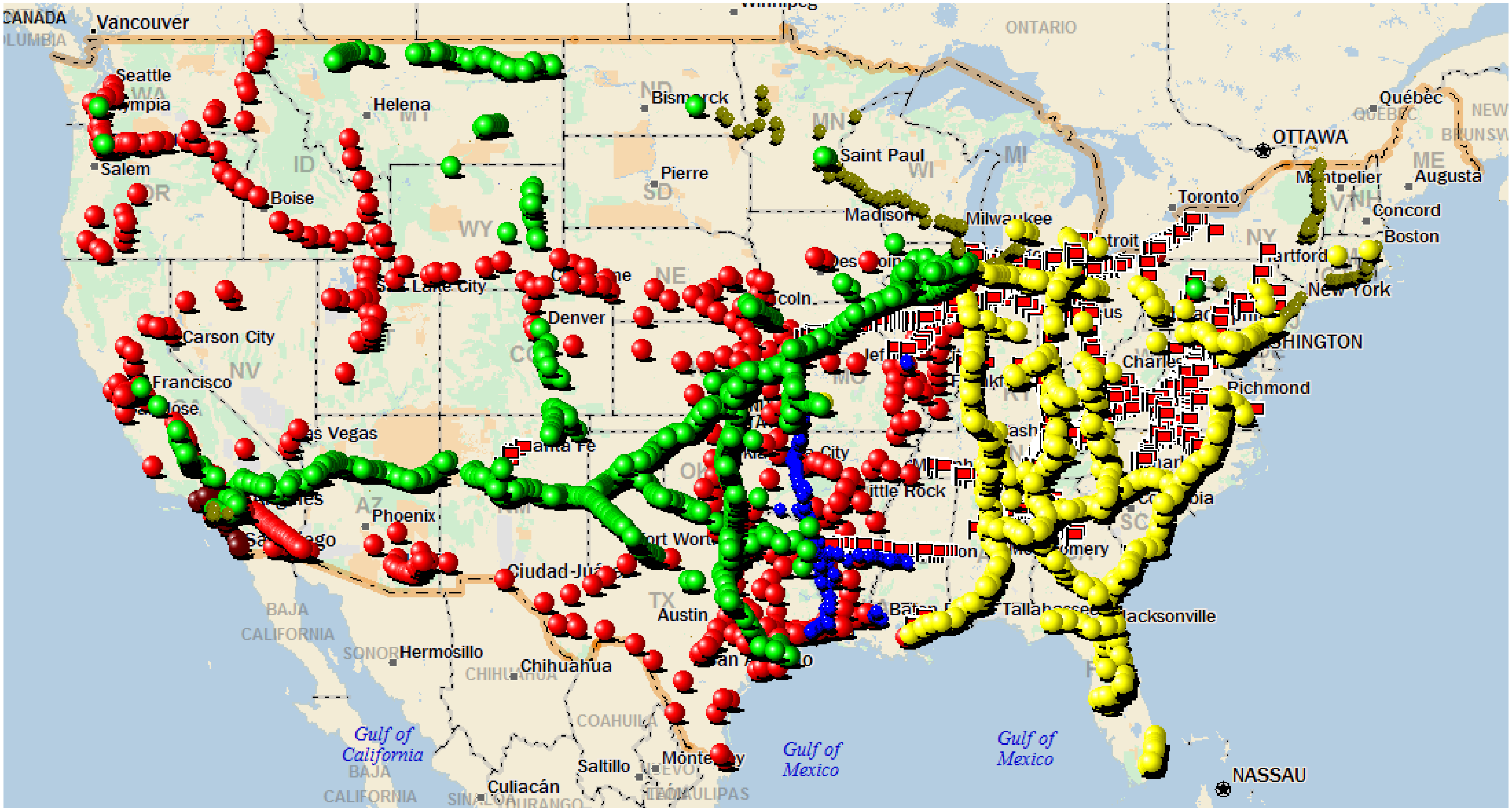
25 kHz	12.5 kHz	6.25 kHz	
81	081	455	161.3250
	181	456	161.3325
82	082	457	161.3400
	182	458	161.3475
83	083	459	161.3550
	183	460	161.3625
84	084	461	161.3700
	184	462	161.3775
85	085	463	161.3850
	185	464	161.3925
86	086	465	161.4000
	186	466	161.4075
87	087	467	161.4150
	187	468	161.4225
88	088	469	161.4300
	188	470	161.4375
89	089	471	161.4450
	189	472	161.4525
90	090	473	161.4600
	190	474	161.4675
91	091	475	161.4750
	191	476	161.4825
92	092	477	161.4900
	192	478	161.4975
93	093	479	161.5050
	193	480	161.5125
94	094	481	161.5200
	194	482	161.5275
95	095	483	161.5350
	195	484	161.5425
96	096	485	161.5500
	196	486	161.5575
97	097	487	161.5650
	197	488	161.5725

Canadian Only Channels

Canadian Border Frequencies

U.S. Border Frequencies

EXHIBIT B



Total number of ATCS licenses: 1749

Only six pairs of frequencies for all the railroads

One or two new ATCS licenses per month

Approximately six renewals per month